in Northern Russia as the Rasputnya season. Mr. Trevor-Battye describes the season as follows :-

> "Rasputnya, as I have been since informed, means, literally, 'the separation of the roads,' but by some process of thought has now come to be the term for a fifth season, for the time which lies between autumn and winter: in short, for the month of October. It means in Northern Russia that the first frosts have thawed and the first snows melted ; that the rivers are blocked with streams of broken ice, the morasses like a quagmire, the tracks, where any advance has been attempted upon old forest bog, a mixture of treacle and glue. Finally, it means, as I have said before, that no one dreams of trying to move until the country is sound and hard under the settled frost. During the whole of October the Government postal service is stopped, labour contracts are off, and the keepers of the stages are entirely freed from their usual obligation to supply the traveller with horses and sleighs."

Undertaking a journey at such a time seemed an act of madness, but it certainly was the means of getting an insight into the character of the North Russian peasant, and of seeing a side of it which might not have been revealed under ordinary circumstances. Their kindly good nature is striking, and throughout the journey, although at first objections were raised and the impossibility of accomplishing the various stages of the journey put forward, still some one was always found willing to supply horses and sleighs, and to accompany the travellers.

After crossing from Kolguev to the mainland, Mr. Trevor-Battye, together with his camp-man Thomas Hyland, and his old spaniel "Sailor," made their way across country to the small village of Askino, on the river Pechora. They were assisted in getting there by the Samoyeds, inhabitants of the *tundra* in the west. Askino is practically the only place where the Russians speak Samoyed, and where there is any apparent intercourse between the two races. At their next destination, Ust Tsilma, also on the Pechora, and which they reached by boat, the condition was quite changed ; for on inquiry not one person could be found who spoke Samoyed, although the two places were only about 180 miles apart.

From Ust Tsilma the journey was continued overland, from *stantsyia* to *stantsyia*, which are log buildings put up by the Government at variable distances apart, and in charge of a *yamshstchik* (driver), who is bound to supply horses and conveyances to any travellers on production of a printed permission. The difficulties of getting conveyances, owing to Rasputnya, and the descriptions of the numerous adventures, especially those connected with crossing the ice-blocked rivers, are of great interest. Archangel was eventually reached, and the travellers considered their difficulties over. The sleigh drive to Vologda, a distance of about 700 miles, was accomplished without any difficulty, as the track was good. Having reached Vologda, the journey home was continued by rail.

The book gives us a good insight into the peasant life. The houses, or rather huts, occupied by the peasants are simple in the extreme, and consist generally of two rooms. In a prominent position in the front room there is always an *ikon*, before which lamps or candles are lighted. Attention is also drawn to the oven or *paitch*, which forms such a feature in these small buildings: and we are told that a characteristic proceeding of a *yamshstchik* on entering a house, "is to cross himself many times before the *ikon*, and the next to climb up to the oven top, from which simmering pulpit he holds forth on the events of the day."

Except for some references to birds and fishes, natural science does not form the same feature in the present book that it did in Mr. Trevor-Battye's previous one, "Ice-bound on Kolguev." This, however, is to be expected, for the journey had to be made with all possible speed. The book is written in a very instructive and pleasing style, and the map and illustrations by the author add much interest to it.

OUR BOOK SHELF.

Vorlesungen über Bacterien. Von Dr. Alfred Fischer, A.O. Professor der Botanik in Leipzig. Pp. 186. (Jena: Gustav Fischer, 1897.)

It is sometimes alleged that bacteriology has suffered, as a pure science, from its association with medicine, since its pathological side has become disproportionately developed. This statement is certainly no longer justified, for the applications of the science to agricultural and manufacturing industries have been found almost as important to the farmer, the dairyman, and the chemist as they have been to the pathologist. Prof. Fischer's book is one which fills a distinct gap in bacteriological literature. Himself a botanist, he treats the subject from a broad and general standpoint. Without neglecting the pathogenic organisms he deals with them only, as it were, incidentally, and the book presents an admirable and judicial summary of the present state of knowledge of bacteriology in its widest and truest sense. It forms a valuable introduction to the subject from whatever point of view it is to be studied, since it affords a solid groundwork upon which more technical and special knowledge may afterwards be built.

The earlier chapters deal with morphology and with the intimate structure of bacteria—matters upon which Prof. Fischer's well-known researches on "plasmolysis" render him well qualified to speak. In the chapters on specificity and classification he shows himself no advocate of the extreme views on pleomorphism which have been advanced by some. In his remarks on classification he insists, with much justice, that strictly morphological characters must form the basis of generic distinctions, and that this matter lies within the province of the botanist alone. The classification which he proposes is a reasonable one, based largely on the character and distribution of the cilia, and the nature of the spores. The mode of life, and physiological properties of bacteria are next described, the chemistry of aërobiosis and anaërobiosis being fully dealt with ; and two chapters are then devoted to the influence of physical and chemical agents, especially in relation to the problems of disinfection. The most fascinating part of the book will, however, be found in the sections devoted to the circulation of nitrogen and of carbonic acid in nature. The assimilation of free nitrogen by bacteria in the soil and in the nodules of Leguminosæ, and the decomposition and nitrification of proteids are set forth by the author with admirable clearness, and the same may be said of the various processes of fermentation with which he also deals. The last three chapters are devoted to pathogenic bacteria, and contain a short account of some of the more important species and their mode of action, with a sketch on serum-therapeutics and immunity. The writer is

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throughout thoroughly impartial and judicial, and shows a healthy scepticism as regards theories unsupported by adequate fact. There can be no doubt that a translation into English of this admirable book would be of great assistance to all those students of bacteriology who are unable to read it in the original.

Lehrbuch der Entwicklungsgeschichte des Menschen. Von Dr. J. Kollmann, o.ö. Professor der Anatomie in Basel. Pp. xii + 658. (Jena: Gustav Fischer, 1898.)

THIS work appears to approach in method the ideal of an elementary text-book of science, since it gives a sound and well-balanced *résumé* of its subject to date, with references to authorities sufficient to place the student in direct touch with original description of detail. The pages of the book never pall, and in treatment and mode of expression it is one of the least "German" of German text-books with which we are familiar. It is illustrated by 386 excellent processed drawings, many of which are coloured, and where original these are very good and such as are likely to become popular. The investigations of His, of course, come in for a full share of recognition, and good use has been made of those of Keibel, Mall, Röse, Toldt, and others among recent workers. The book is divided into five leading sections. An introduction of sixteen pages is followed by portions dealing with the earlier stages of development ("Progenie" and "Blastogenie"), treated as far as is necessary comparatively. The fœtal membranes and progressive development of the human fœtus next come in for consideration; but the bulk of the work (405 pages) is of necessity devoted to a description of the development of systems and organs, and there is appended a twenty-page dissertation on heredity. Not the least pleasing feature of the book is its consummately artistic plan. Illustrations never obtrude themselves upon the margin nor overpower the text. In the placing of the figures, choice of their colour and descriptive letterpress, there are evidences of the bestowal of great care and forethought and of painstaking consideration of detail, which are alone a strong recommendation of the work. It is carefully written and non-pedantic, and should be deservedly popular.

Missouri Botanical Garden. Ninth Annual Report. Pp. 160. (St. Louis, Missouri: published by the Board of Trustees, 1898.)

ADMINISTRATIVE details occupy but a small part of this report, the chief contents being a collection of scientific papers and notes on interesting plants, illustrated by several half-tone plates. The results of the studies of the American Lemnaceæ occurring north of Mexico, by various botanists, are brought together by Mr. C. H. Thompson, and are combined with his own researches into a revision of the order. Mr. H. C. Irish contributes to the report a revision of the genus Capsicum, with especial reference to garden varieties. Mr. J. N. Rose describes five species of agaves which flowered in the Washington Botanic Garden in 1897, and were identified by him. One of these (*A. Washingtonensis*) appears to have been hitherto undescribed. Among the notes, Mr. William Trelease, the Director of the Gardens, records some interesting observations on Yuccas. He points out that *Yucca gigantea* is distinct from *Y. gloriosa* and *Y. Guatemalensis*—its nearest allies—and gives a figure of an Azorean specimen which is a good example of the species. With reference to the extent of the pollination of Yuccas by the Yucca moth, Mr. Trelease has now obtained information which proves the moth to be "the active agent in the pollination of Yuccas from Florida northward as far as fruit is set as a result of *Pronuba* activity, westward as far as southern California, and into the mountains of northern Mexico to the south."

LETTERS TO THE EDITOR

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Liquefaction of Hydrogen.

YOUR last issue contains a report of Prof. Dewar's remarkable achievement in the liquefaction of hydrogen and helium. In his account of it, which you quote, Prof. Dewar describes the apparatus employed as an enlarged plant of the same type as that used in his hydrogen-jet experiments discussed in his paper before the Chemical Society of December 19, 1895 (see *Proceedings*, No. 158), and in his lecture at the Royal Institution (see *Proceedings*, 1896), and illustrated in a figure printed with this lecture. An examination of that illustrative figure and of the description shows that the type of apparatus used involves an entirely new departure as compared with the methods of all who had liquefied air before 1895, including Prof. Dewar himself. The new self-intensive method then and now employed is a combination of the following four points: *a long tube conveying compressed gas, expansion of the compressed gas through a nozzle or throttle-valve, direct return of all the expanded gas over the tube of compressed gas, good interchange of temperatures between the compressed and expanded gas.* The new method embodying the above combination will be found fully described and illustrated in my patent, No. 10,165, 1895 (May 23). What is equally important historically: in November 1894, more than twelve months before Prof. Dewar first showed this new method in action, liquefying air, I had called, with an introduction, on his chief assistant, Mr. R. N. Lennox, at the Royal Institution, had there explained to him this self-intensive method, and had proposed it as a means of obtaining intensely low temperatures. By employing this method I was afterwards the first in this country to liquefy air and oxygen without employing other refrigerants. Since then, at the Royal Institution, where alone sufficient means are available for the prosecution of these researches, the same method has bridged over the space, impassable by former methods, between the temperature of liquid air and that of liquid hydrogen and helium, thus proving itself a new and valuable scientific instrument.

Under these circumstances I think that Prof. Dewar, seeing he was aware of the facts at the time of his account, ought not to have been content with eulogising the services of his assistant Mr. Lennox, but should also have given me credit for the invention of the method which has procured him so great a success. Although he has been easily able to find in old patents the separate elements which go to make up the new method—this can be done for any new invention—he has nowhere found, before the date of my communication to Mr. Lennox, that combination of the four points given above which is absolutely necessary to his apparatus for liquefying hydrogen.

The facts referred to above are stated and discussed in greater detail in a paper, to be printed shortly, which was read by me before the Society of Chemical Industry at Burlington House on the 2nd inst., with illustrative diagrams, and in letters by me to *Engineering* for April 15 and May 6.

W. HAMPSON.

Concerning the Thermodynamic Correction for an Air-Thermometer.

IT is common in works on thermodynamics to give a formula for the thermodynamic correction applicable to an air-thermometer; the following is substantially the usual proof.

Accepting the current theory of the Joule-Thomson experiments, we may show that

$$t\frac{dv}{dt} - v = k\frac{\delta t}{\delta p},$$

where k is the specific heat at constant pressure measured dynamically. From this we obtain

$$t\frac{dv}{dt} = v + k\frac{\delta t}{\delta p}$$

and

$$t = \left(v + k\frac{\delta t}{\delta p}\right) \div \frac{dv}{dt}.$$

Thus t is seen to consist of two terms; the second term

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